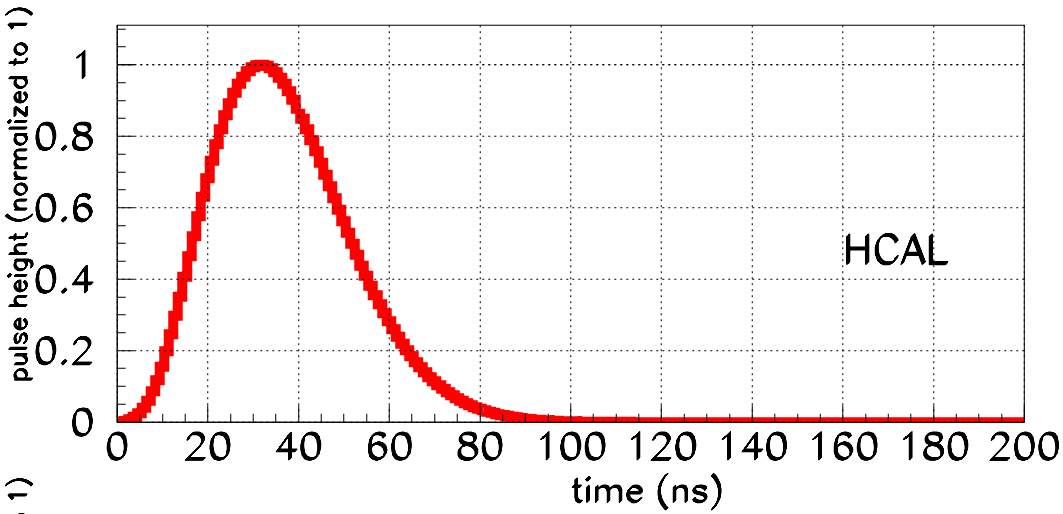
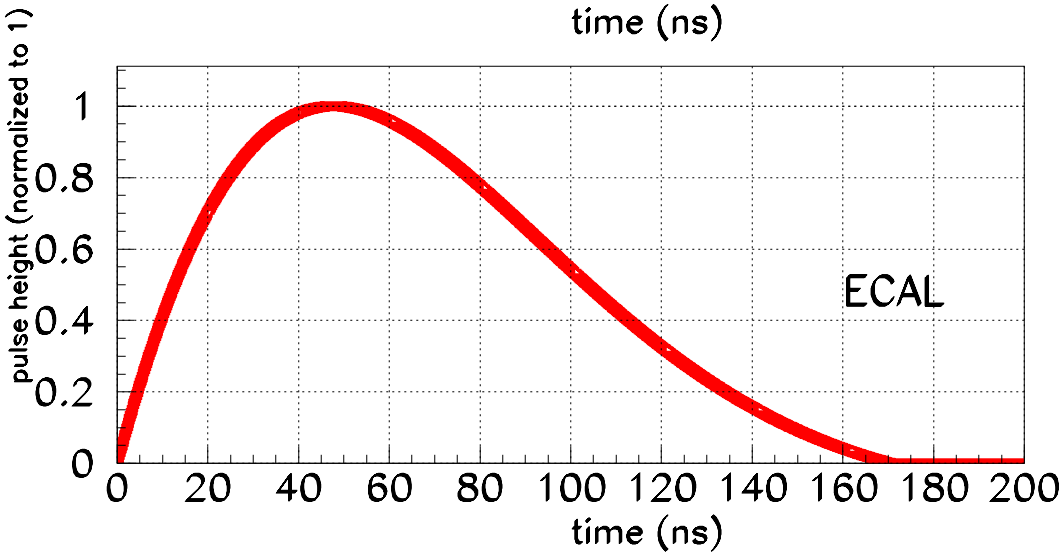
Effect of Pulse Shape on Bunch X-ing ID in ORCA

Sarah Eno

Three pulse shapes

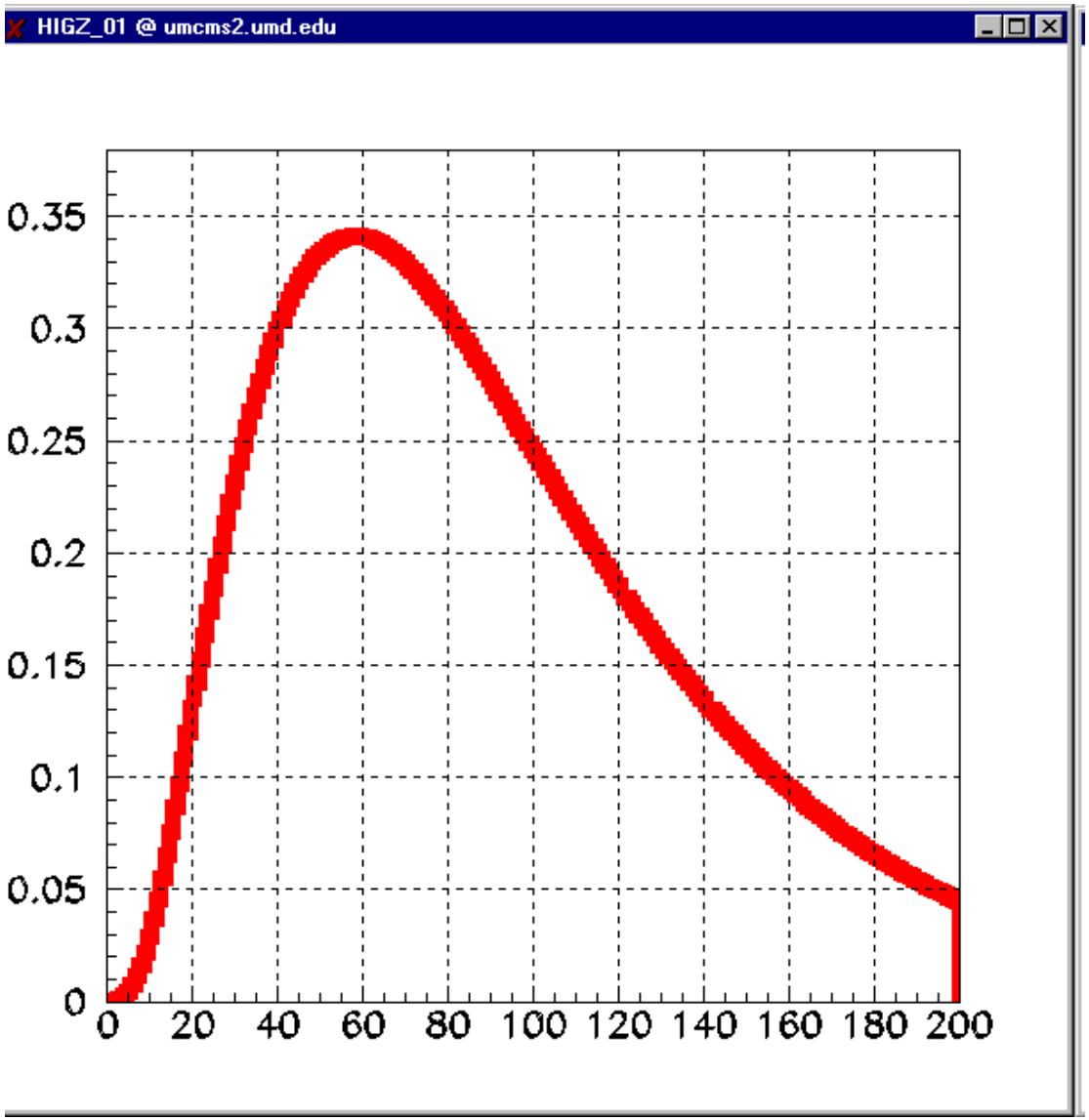


“old” HCAL



ECAL

Three Pulse shapes



"new" HCAL (suggested by Shuichi)= old with preamp shaping time changed from 25 ns to 40 ns and changing preamp shape to $(t/\tau)\exp(-t/\tau)$

Weights for this shape are:

0 -0.886526
1 -0.886526
2 -0.886526
3 -0.786262
4 0.715698
5 1.25078
6 0.979966
7 0.499392
8 0
9 0

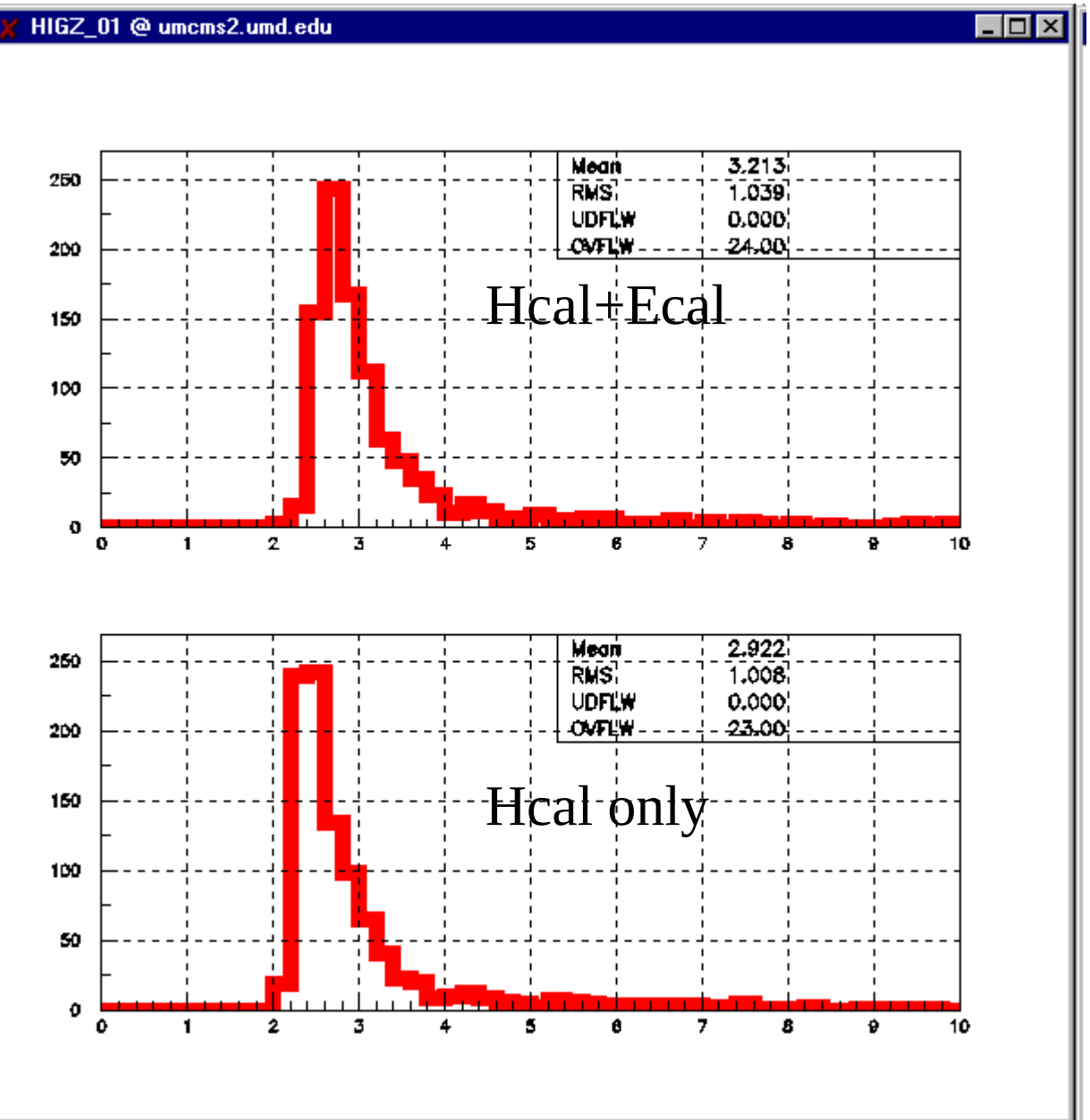
(but remember, the weights are determined by the noise, which may be wrong in ORCA)

vocabulary

“digi” - reconstructed energy deposited in one of the layers of a tower.

HB has 4 layers in CMSIM116: r=180,190,300,320
HE has 2: z=380,390,900
HF has 3: z=1100,1120,1200

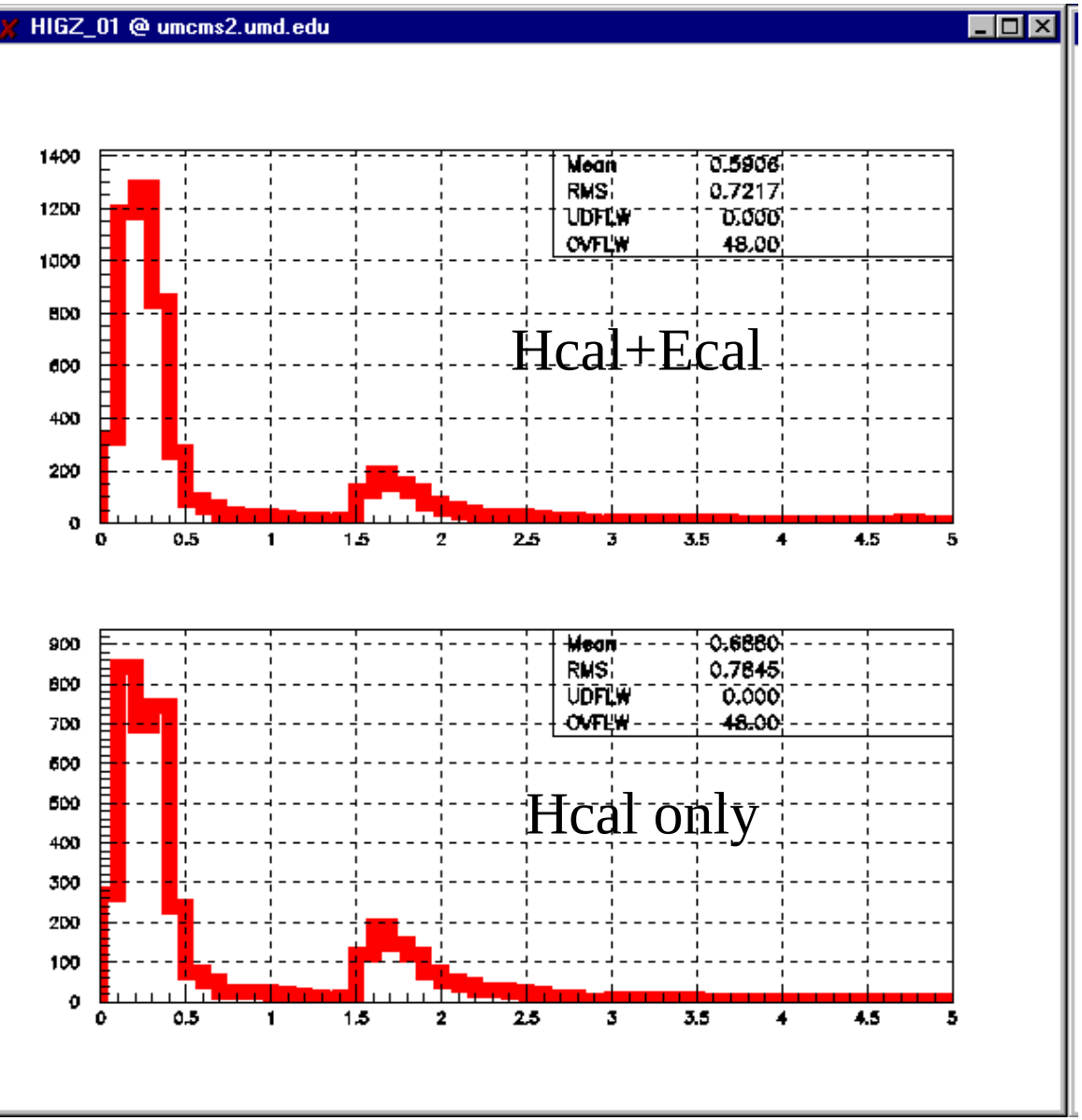
Muons



Total Et in HCAL and HCAL+ECAL for 30 GeV muons, eta 0.4, phi=90

no noise, no pileup

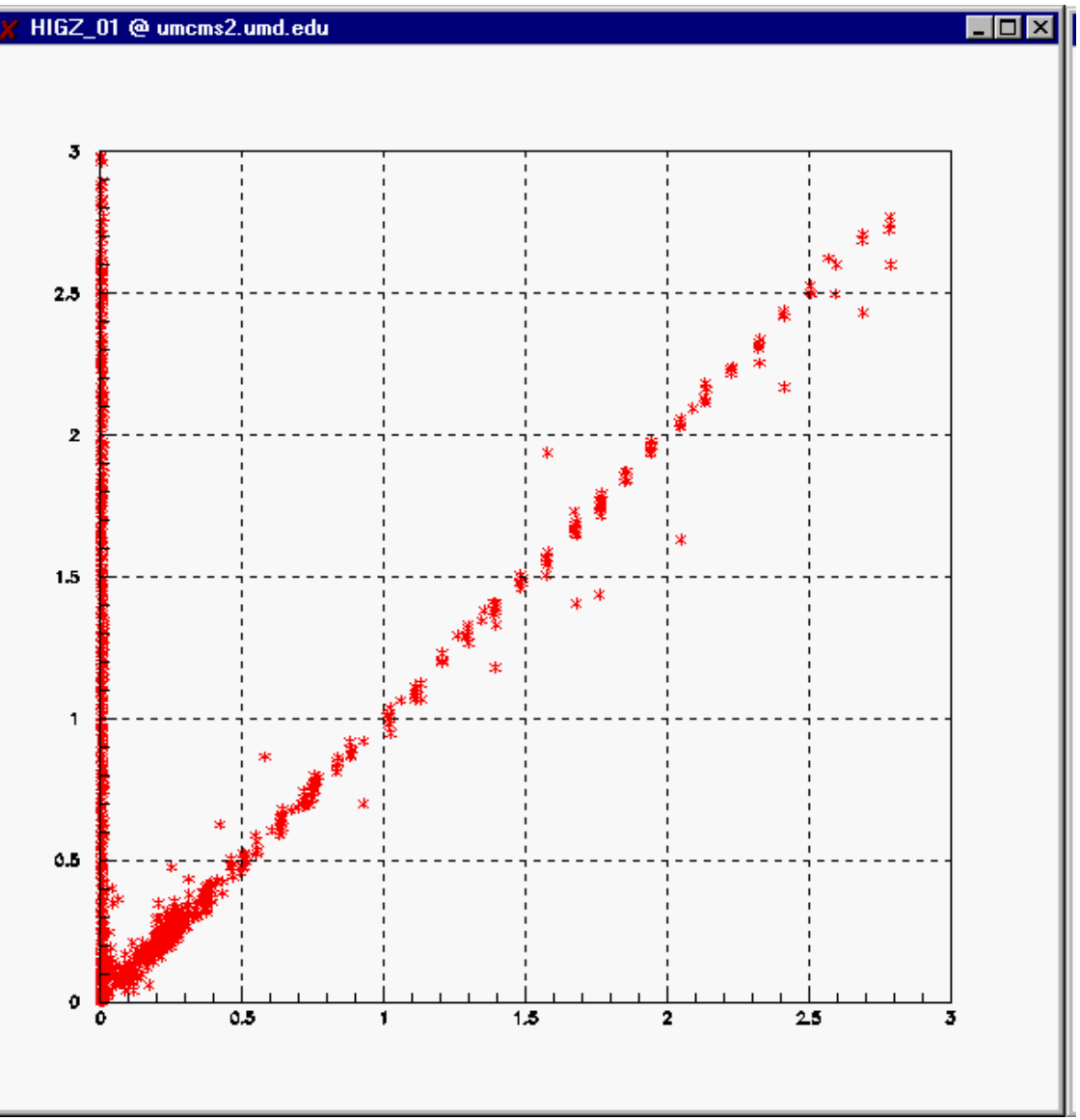
Muons



Digi Et in HCAL and HCAL+ECAL for 30 GeV muons, eta 0.4, phi=90

no noise no pileup

Start with “old” HCAL



30 GeV muons, eta =0.4, phi=90
Min bias overlay: 17.4 per crossing
noise on, poisson on

x-axis: true energy deposited in the crossing by the muon

y-axis: reconstructed energy of digi (=sum_I=1,10 (timesample_i * weight_i)

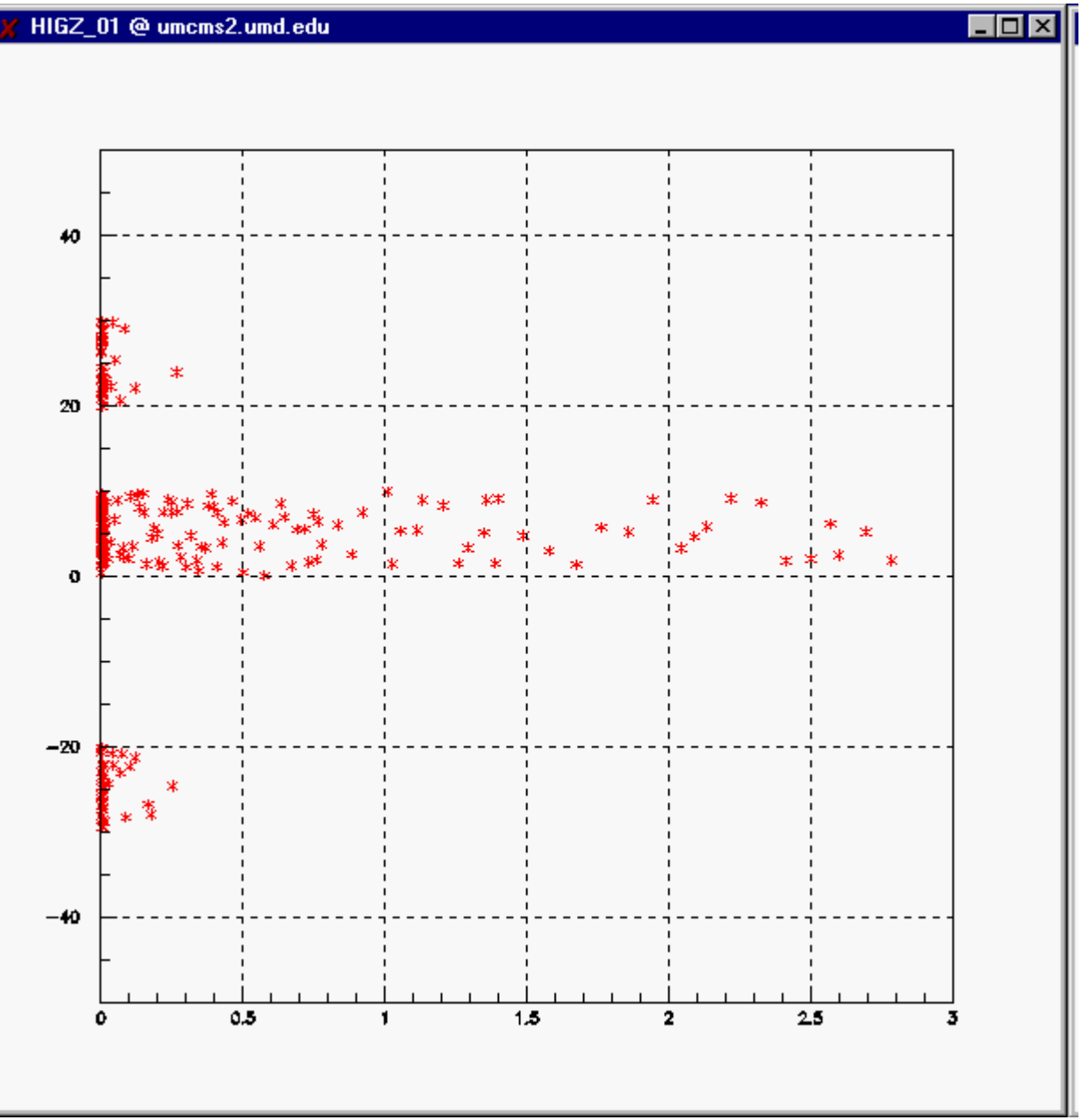
Bunch Crossing ID

Try Ecal group's algorithm:

muon in timesample number 5.

Caculate energy with normal weights, weights shifted early by 1 crossing, weights shifted late by one crossing. Assign energy to crossing that gives maximum Et.

“old” HCAL

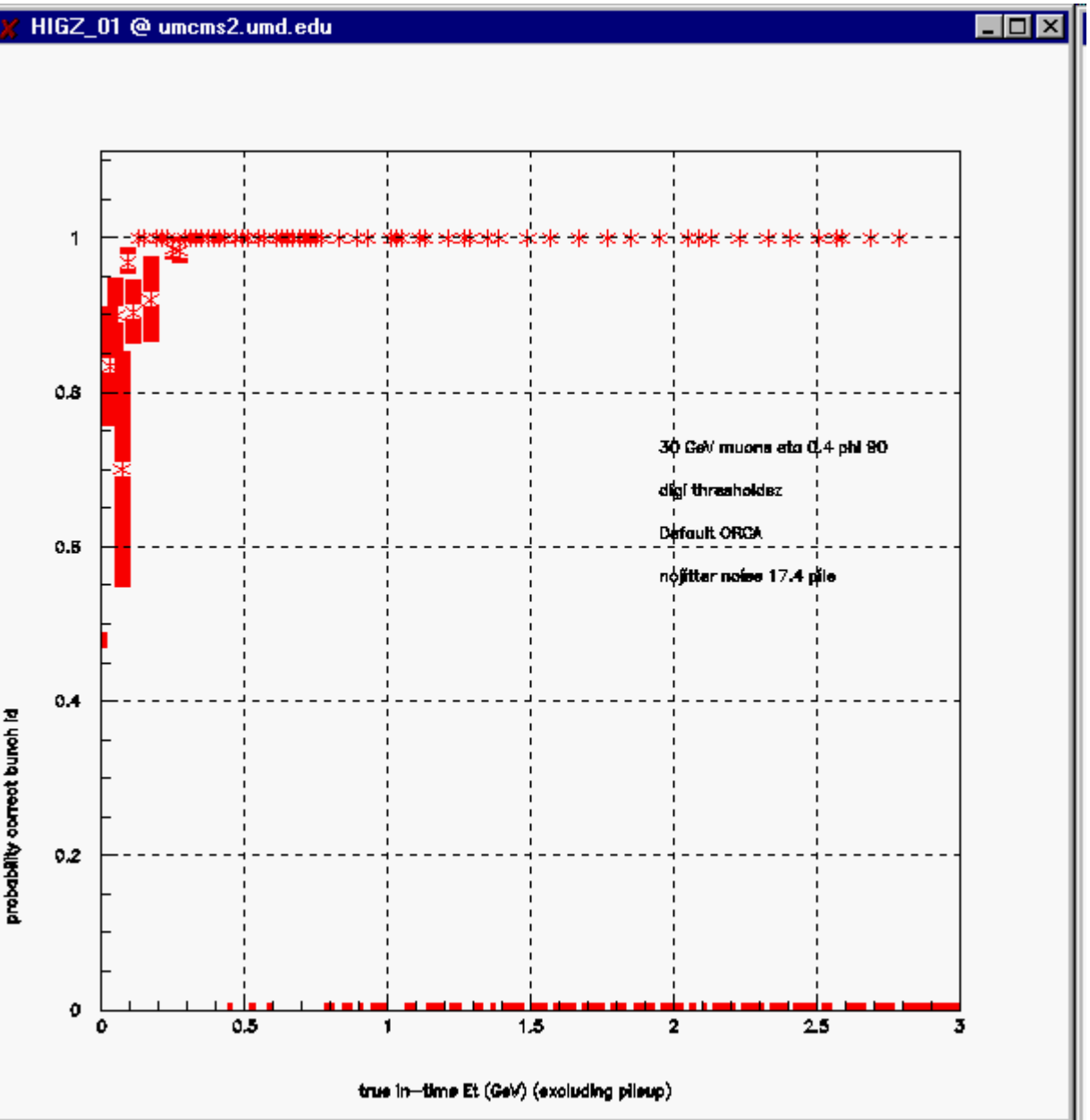


30 GeV muons, eta =0.4, phi=90
Min bias overlay: 17.4 per crossing, noise on, poisson on

x-axis: true digi Et from the muon

y-axis: reconstructed digi time

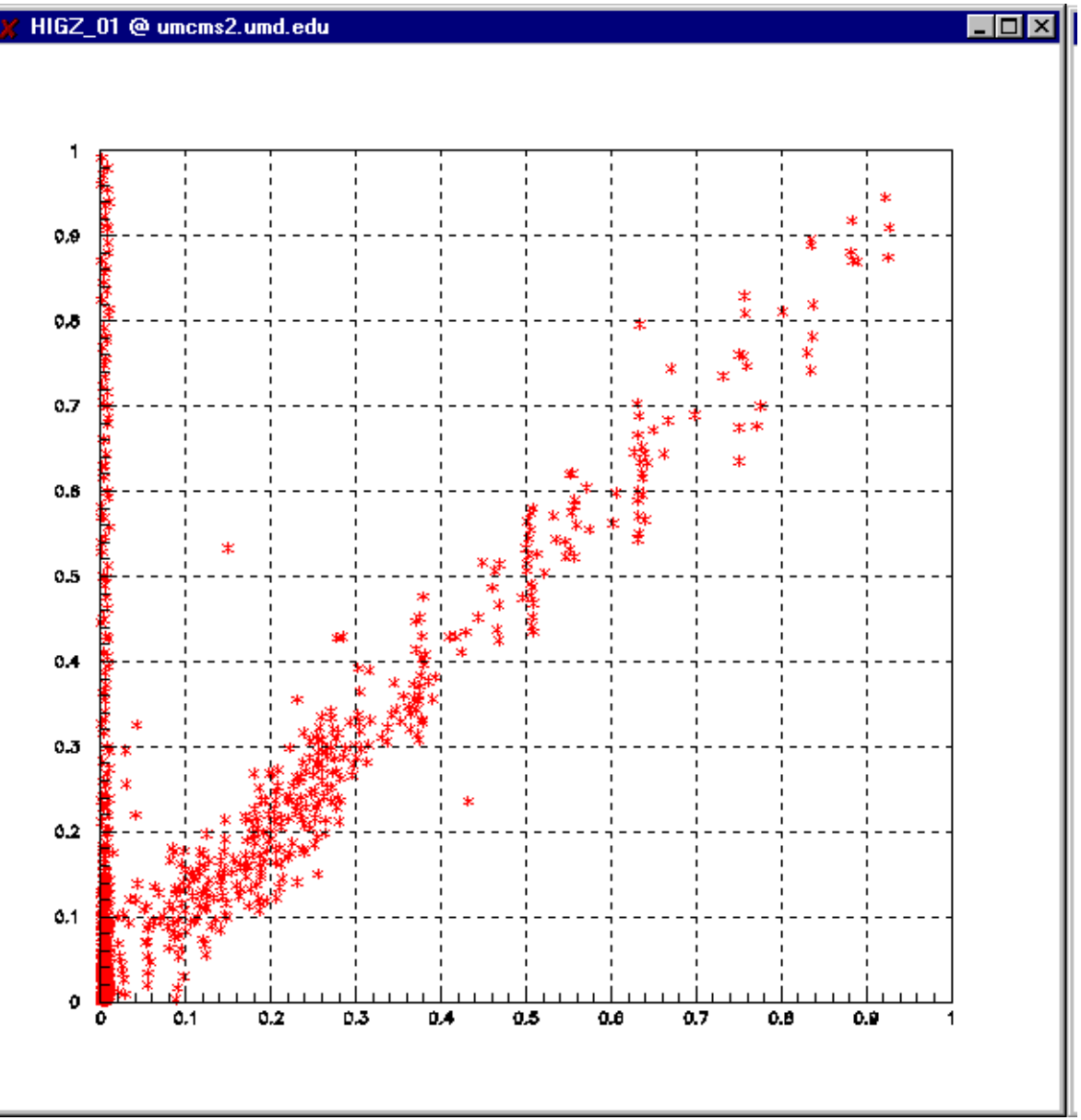
“old” HCAL



X-axis: true digi Et from muon

y-axis: probability bunch is id’d correctly

“new” HCAL

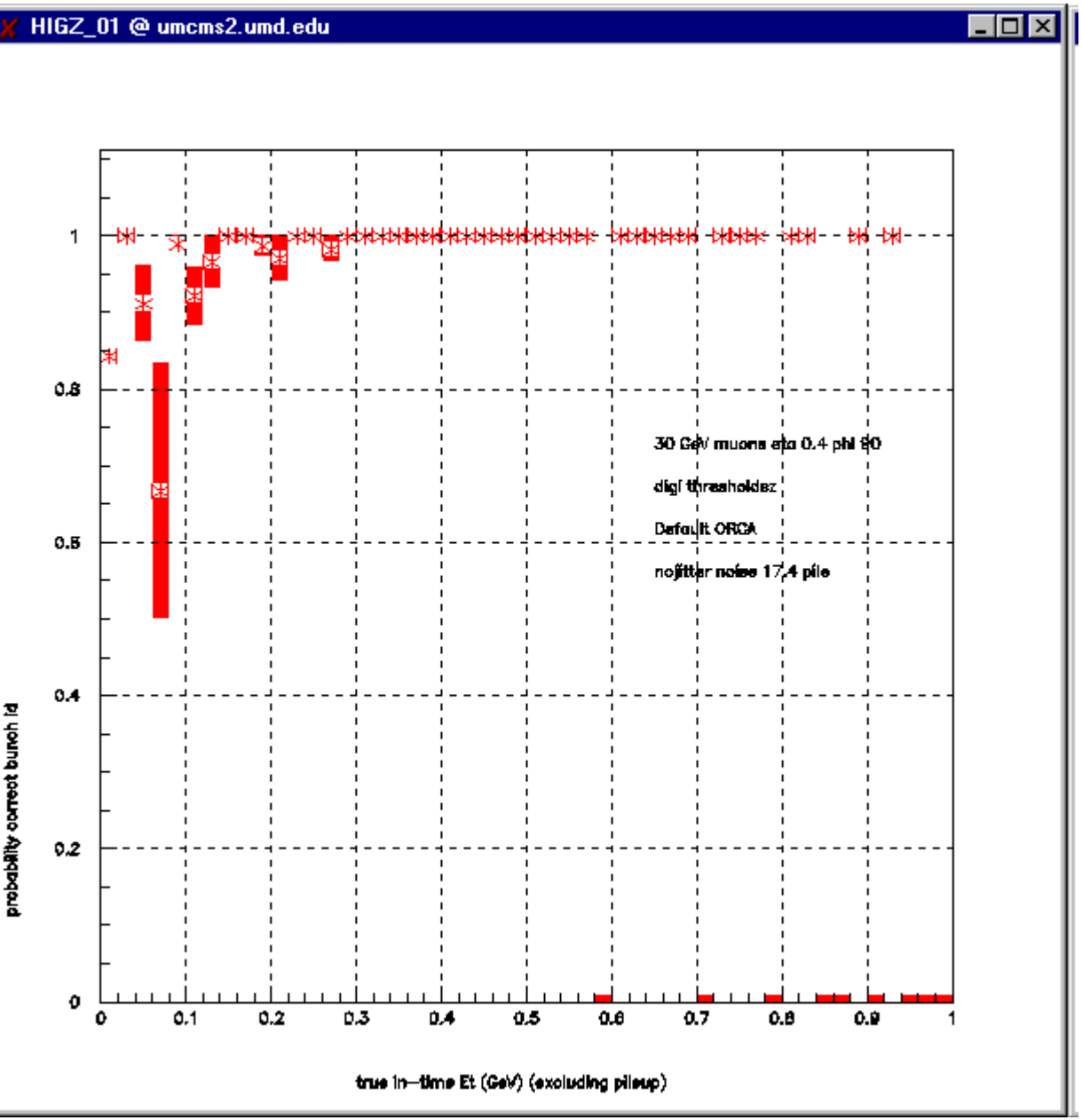


30 GeV muons, eta =0.4, phi=90
Min bias overlay: 17.4 per crossing, noise on, poisson on

x-axis: true digi Et from the muon

y-axis: reconstructed digi Et

“new” HCAL



X-axis: true digi Et from muon

y-axis: probability bunch is id’d correctly